

A Zoogeographical Sketch of the Fresh-water and Terrestrial Leeches (Hirudinoidea)

By

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*To Professor Endre Dudich, Ph. D.
on His 75th Birthday*

Zoogeographical information on leeches is rather sketchy even in these days. AUTRUM's (1939) excellent work has hitherto been the sole basic survey which summarized and, as far as possible, evaluated the available evidence in a world-wide treatment. By this, I do not wish to say that no progress has been made in this field in the past 30 years, but merely to state that the works published during this period (e.g. MANN, 1967; MOORE, 1959; RICHARDSON, 1968; RINGUELET, 1944, 1968; SCIACCHITANO, 1963) presented a comprehensive picture, or eventually an evaluation, of the zoogeographical conditions of only some continental areas (Australia, Europe, North and Middle America) or zoogeographical (Ethiopian and Neotropical) regions.

In the followings, I propose to attempt a short summary—based on the recent systematic, faunistic, zoogeographical and ecological results obtained in the last 30 years—of our knowledge concerning the present zoogeographical information on fresh-water and terrestrial leeches. It is not my aim to submit an ecological, regional, and faunagenetical analysis and interpretation—even our present day information is highly insufficient for this purpose—but to call attention on systematic, zoogeographic and ecologic problems and faunistic deficiencies found in the course of elaboration of this survey. I am confident that a study of the Tables and the comparison and consideration of the data submitted below will give rise to a number of ideas in all hirudinologists for their respective “zoogeographical fields” and research projects.

It is my contention that progress in the zoogeographical study of leeches is hindered primarily by the following causes and factors:

1. The wellnigh complete absence of fossil material. The one or two findings which proved to represent true leech impressions fail to present any adequate basis either for the support of evolutionary processes or the establishment of the level of anatomical organization.

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2. Since leeches are the representatives of a geologically most ancient group, the lack of fossils renders almost hopeless the task of tracing the organizational, habitat, life-form, and other changes affecting the group during the past two or three hundred million years. The inference seems unassailable that the recently living, about 500, species of the group represent but a fragment of an essentially richer one extant in the geologic past. Among the recent species, marine, fresh-water, amphibious, terricolous and terrestrial taxa can equally be found. There are predatory, periodic or more seldom obligatorily sanguisugous, externally or indeed internally parasitic, species. It seems certain that their progenitors had been marine, and surely omnivorous or predatory, animals. However, it were most difficult to give an answer, even an approximately correct one, to the question when, where, and how had which species and species groups changed their habitats and habits, and in how far they had been effected thereby. Thus, to give only one example, it were presumptuous to decide which of the presently marine species are primarily marine and which became only secondarily such.

3. The obsolete state of taxonomic studies have greatly impeded, and in many cases still hampers, zoogeographical researches. To wit, it was found in the course of anatomical examinations that a good number of early species, described almost exclusively on the ground of their external morphological features, had been incorrectly assigned as to systematic place and evaluated as to category rank. The faulty relegations, a number of still missing redescriptions, and the relatively meagre amount of distributional data all contributed to the rise of countless problems appearing with respect to the zoogeographical subdividing of the recent fauna, the delimitation, inter-relationship, and origin of the regional faunas, as well as the singular and frequently apparently inexplicable distribution of species, genera, or indeed families.

4. The clarification of zoogeographical problems is further delayed by the comparatively few ontogenetical and embryological studies, although their results might—naturally by a most circumspect and moderate application—furnish most valuable suggestions in the understanding of evolutionary processes, especially in view of the lack of fossils. Researches of this kind have, for instance, demonstrated the way of emergence of certain sanguisugous species into predatory ones.

5. Well utilizable results may be expected from the recently flourishing but still sporadically conducted genetical investigations. In this field, it is mainly researches into the chromosome sets and crossing experiments made with the spermatophores of related species which may provide valuable information—via the understanding of connections of relationship and evolutionary processes—for zoogeographical investigations.

Even these few—and by far not complete number of—data concerning the causes, factors, and deficiencies involved in the main problem outlined above will clearly indicate why the study of the zoogeographical problems of the leeches is considerably more difficult—and resting on more unstable grounds—than that of e.g. the vertebrates, insects, or even the mollusks.

After these preliminary remarks, I propose to submit the respective stock of informative material—and to facilitate survey—in a contiguous tabulation according to families. The order of sequence follows DUDICH's (1942) zoogeographical divisions (Fig. 1). The Tables permit an immediate reading

concerning the occurrence of the genera and their species per zoogeographical region or regions. Following the Tables, I summarize available information per zoogeographical regions, listing the endemic genera and their connections with other zoogeographical regions, and finally submit some remarks on taxonomic, zoogeographic, and other problems to be clarified in the future.

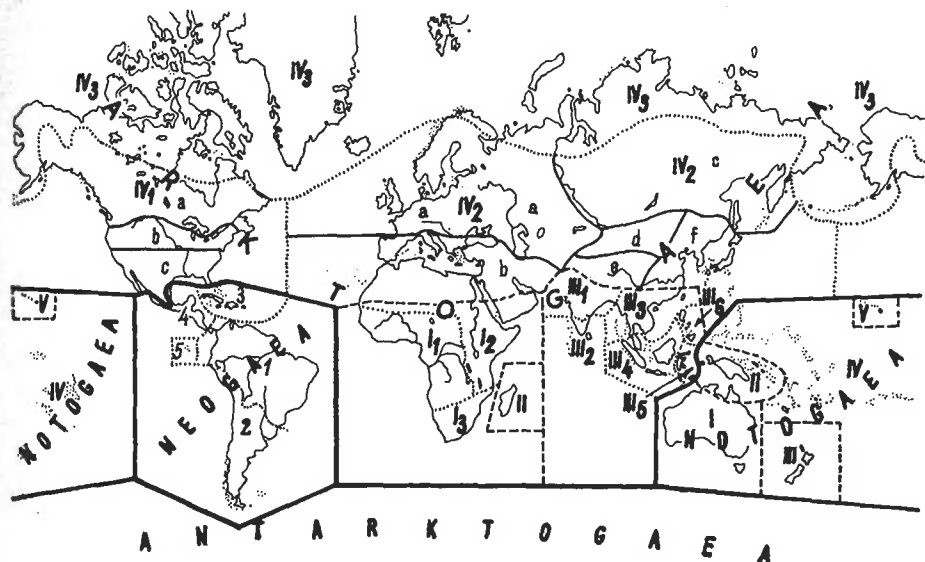


Fig. 1. The zoogeographical divisions of the World. — *Notogaea*: I = Australian, II = Austro-Malayan, III = New Zealandian, IV = Polynesian, V = Hawaiian Regions. — *Neogaea*: Neotropic Region: 1 = Brazilian, 2 = Chilean, 3 = West Indian, 4 = Middle American, 5 = Galapagos Subregions. — *Arclogaea*: I = Ethiopian Region: I₁ = West African, I₂ = East African, I₃ = South African Subregions, II = Malgassian Region, III = Oriental Region: III₁ = Indian, III₂ = Ceylonese, III₃ = South-East Indian, III₄ = Sunda, III₅ = Celebes, III₆ = Philippine Subregions. IV = Holarctic, IV₁ = Nearctic Region: a = Canadian, b = Transitional, c = Sonoran Subregions. IV₂ = Palaearctic Region: a = Euro-Turanian, b = Mediterranean, c = Siberian, d = Inner Asian, e = Tibetan, f = East Asian Subregions. IV₃ = Arctic. — *Antarctogaea* (after DUDICH)

Some notes for the use of the Tables:

1. Following the generic names, the number of species and subspecies (indicated by the symbol +) is given in brackets.
2. The figures appearing in the columns give the number of species of the respective genus occurring in the region. The number of subspecies are added in brackets.
3. Sections outlined in heavy lines embrace the number of species of the endemic genera inhabiting the respective region.
4. The taxonomic evaluation of the families, genera, and species, as well as the establishing of the distribution of the species are based on the findings published in my serial paper (Soós, 1965–1969), except for the following minor alterations and addenda. I regard the genus *Herpobdelloidea* as valid and not a junior synonym of *Salpa*; I remove the species *Poecilobdella blanchardi* (MOORE, 1901) from the genus and consider it a representative of a distinct genus (no name has been given it, and it appears in the Table as "Gen. nov. for *Poecilobdella blanchardi*"). In addition, I list among the Haemadipsidae the taxon *Neoterrabdella australis* recently described by RICHARDSON (1969), as well as his *Bogabdella diversa* (1969), among the fresh-water Piscicolidae. Finally, I remove the genera *Nesophilaemon* and *Mesobdella* from the Haemadipsidae and assign them to a distinct family (Mesobdellidae).

Table 1*

Genera	Noto- gaea	Arctogaea					Neogaea	
	Australian region	Oriental region	Ethiopian region	Malgassian region	Palaearctic region	Neartic region	Neotropic region	
Fam. Erpobdellidae:								
<i>Fadejewobdella</i> (1)					1			
<i>Archaeobdella</i> (1)					1			
<i>Orobodella</i> (3)					3			
<i>Nephelopsis</i> (1)						1		
<i>Dina</i> (11+1)					4(1)	7		
<i>Erpobdella</i> (8+2)					5(1)	2(1)	3	
<i>Nematobdella</i> (1)		1						
<i>Herpobdelloidea</i> (1)		1						
<i>Odontobdella</i> (1)		1			1			
<i>Trocheta</i> (4)		2			2			
<i>Mimobdella</i> (3)		1	1		1			
<i>Salifa</i> (2)			2	?1				
<i>Barbronia</i> (3+1)	1(1)	1(1)	1		1			
<i>Dineta</i> (1)	1							
<i>Blanchardiella</i> (11)							2	9
<i>Cylicobdella</i> (5)							1	4
<i>Hypsobdella</i> (1)								1
<i>Lumbricobdella</i> (2)								2
	2(1)	7(1)	4	?1	19(2)	10(1)	6	16
							22	
Fam. Trematobdellidae:								
<i>Trematobdella</i> (1)			1					
<i>Foraminobdella</i> (1)		1						
<i>Acrabodella</i> (1)		1						
<i>Gastrostomobdella</i> (3)	1	2						
	1	4	1	0	0	0	0	0

* In the first column of the Neotropical Region, the number of species occurring only in the Middle American Subregion are listed.

Genera	Noto- gaea	Arctogaea					Neogaea	
	Australian region	Oriental region	Ethiopian region	Malagassian region	Palaearctic region	Nearctic region	Neotropic region	
Fam. Hirudinidae:								
<i>Haemopsis</i> (1)					1			
<i>Mollibdella</i> (1)						1		
<i>Bdellarogatis</i> (1)						1		
<i>Percymoorensis</i> (4)						4		
<i>Philobdella</i> (2)						2		
<i>Macrobdella</i> (3)						3	1	
<i>Poecilobdella</i> (4+1)		4(1)						
<i>Dinobdella</i> (2)		2			1			
<i>Whitmania</i> (5)		2			5			
<i>Asiaticobdella</i> (4)		3			2			
<i>Myxobdella</i> (4)		1	2		2			
<i>Limnatis</i> (17)		2	15		1			
<i>Hirudo</i> (15)		1	11		3			
<i>Praobdella</i> (3)			3					
<i>Limnobdella</i> (5)							5	
<i>Pintobdella</i> (1)							1	
<i>Oxyptychus</i> (7)								7
Gen. nov. for <i>Poecilobdella blanchardi</i>								1
<i>Richardsonianus</i> (4)	4							
<i>Hirudobdella</i> (1)	1							
<i>Goddardobdella</i> (1)	1							
<i>Eunomobdella</i> (1)	1							
<i>Euranophila</i> (1)	1							
<i>Quantenobdella</i> (1)	1							
<i>Aetheobdella</i> (1)	1							
<i>Ornithobdella</i> (1)	1							
	11	15(1)	31	0	15	11	7	8
							15	

Genera	Noto-gaea		Arctogaea				Neogaea	
	Australian region	Oriental region	Ethiopian region	Malgassian region	Palaeartic region	Neartic region	Neotropic region	
Fam. Semiscolecidae:								
<i>Semiscolecoides</i> (1)							1	
<i>Orchibdella</i> (1)								1
<i>Cyclobdella</i> (1)								1
<i>Semiscolex</i> (7)			1					6
	0	0	1	0	0	0	1	8
Fam. Haemadipsidae:							9	
<i>Planobdella</i> (2)		2						
<i>Tritetrabdella</i> (1)		1						
<i>Neoterrabdella</i> (1)	1							
<i>Phytobdella</i> (4)	3	2						
<i>Philaemon</i> (4)	3	1		1				
<i>Chtonobdella</i> (5)	4			1				
<i>Haemadipsa</i> (8+7)	1	6(7)		1	0(1)			
<i>Idiobdella</i> (1)				1				
	12	12(7)	0	4	0(1)	0	0	0
Fam. Mesobdellidae:								
<i>Nesophilaemon</i> (1)								1
<i>Mesobdella</i> (3)			1					2
	0	0	1	0	0	0	0	3
Fam. Diestecostomatidae:							3	
<i>Xerobdella</i> (2)					2			
<i>Diestecostoma</i> (3)							3	
	0	0	0	0	2	0	3	0
Fam. Americobdellidae:							3	
<i>Americobdella</i> (1)								1
	0	0	0	0	0	0	0	1
							1	

Genera	Noto- gaea	Arctogaea				Neogaea	
	Australian region	Oriental region	Ethiopian region	Palaeartic region	Neartic region	Neotropic region	
Fam. Glossiphoniidae:							
<i>Glossiphonia</i> (11+3)	4(1)	4	4	3(3)	2		2
<i>Plucobdella</i> (31)	3	9	6	3	6	3	4
<i>Helobdella</i> (28)		2	2	1	3	5	22
<i>Batrachobdella</i> (16)		6	4	3	1	1	2
<i>Theromyzon</i> (11+1)		2	2	6(1)	3		2
<i>Ancyrobdella</i> (1)				1			
<i>Baicalocleipsis</i> (2)				2			
<i>Boreobdella</i> (1)				1			
<i>Oligocleipsis</i> (1)				1			
<i>Paratorix</i> (1)				1			
<i>Actinobdella</i> (3)					3		
<i>Marvinmeyeria</i> (1)					1		
<i>Oligobdella</i> (4)				2	1		1
<i>Hemicleipsis</i> (5)		3(1)		2			
<i>Torix</i> (2)		1		1			
<i>Parabdella</i> (5)		2	3				
<i>Paracleipsis</i> (2)		2					
<i>Marsupiobdella</i> (1)			1				
<i>Oculobdella</i> (1)						1	
<i>Podocleipsis</i> (1)							1
<i>Desmobdella</i> (1)							1
<i>Haementeria</i> (5)						1	5
	7(1)	31(1)	22	27(4)	20	11	40

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Genera	Notogaea	Arctogaea				Neogaea	
	Australian region	Oriental region	Ethiopian region	Palearctic region	Nearctic region	Neotropic region	
Fam. Piscicolidae:							
<i>Codonobdella</i> (1)				1			
<i>Trachelobdella</i> (4)				4			
<i>Heptacychus</i> (1)				1			
<i>Piscicolaria</i> (1)					1		
<i>Illinobdella</i> (4)					3	1	
<i>Cystobranchnus</i> (8)		1		3	3	1	
<i>Piscicola</i> (11)		2		4	5	1	2
<i>Phyllobdella</i> (1)			1				
<i>Bogabdella</i> (1)	1						
<i>Ozobranchnus</i> (1)		1					
	1	4	1	13	12	3	2
						5	

As regards the faunal analyses per region, it should be noted that they do not comprise

1. genera of a world-wide distribution, occurring in all zoogeographical regions (*Glossiphonia*, *Placobdella*), or those occurring everywhere excepting the Notogaea (*Helobdella*, *Batrachobdella*, *Theromyzon*);

2. genera of the fresh-water Piscicolids which contain also marine species, or in which these latter predominate (*Ozobranchnus*, *Trachelobdella*), and genera which have been spread and introduced by their hosts (*Piscicola*, *Cystobranchnus*).

Palearctic Region

Of the 36 genera (76 species and 7 subspecies) known from the Region,

1. Endemic are (12, with 16 species): *Archaeobdella*, *Fadejewobdella*, *Haemopsis*, *Xerobdella*, *Boreobdella*, *Baicaloclepsis*, *Paratorix*, *Codonobdella*, *Orobdella*, *Ancyrobdelella*, *Oligoclepsis*, *Heptacychus*;

2. Holarctic are (1+2): *Dina*, *Erpobdella* (3 species inhabiting also Middle America), *Oligobdella* (1 species known also from the Neotropic Region but its generic assignment needs revision);

3. Common with the Oriental Region are (6): *Trocheta*, *Hemiclepsis*, *Odonobdella*, *Dinobdella*, *Whitmania*, *Asiaticobdella*, *Haemadipsa zeylanica japonica*, *Torix*;

4. Palaeotropic are (4+1): *Mimobdella*, *Myxobdella*, *Limnatis*, *Hirudo*, *Barbronia* (1 species and 1 subspecies occurring also in the Notogaea).

Nearctic Region

Of the 20 genera (53 species and 1 subspecies) known from the Region,

1. Endemic are (8, with 14 species): *Nephelopsis*, *Mollibdella*, *Bdellarogatis*, *Percymoorensis*, *Philobdella*, *Actinobdella*, *Marvinmeyeria*, *Piscicolaria*;

2. Holarctic are (1+2): (see Palaeartic Region);

3. Common with the Neotropic Region (but only with the Middle American Subregion) are (2+1): *Macrobodella*, *Illinobdella*, *Erpobdella*.

There are no genera common with the other subregions of the Neotropic Region (except perhaps the genus *Oligobdella*).

Neotropic Region

Of the 31 genera (109 species) known from the Region,

1. Endemic are (19, with 50 species): *Blanchardiella*, *Cylicobdella*, *Hypobdella*, *Lumbricobdella*, *Limnobdella*, *Pintobdella*, *Oxyptychus*, Gen. nov. for *Poecilobdella blanchardi* (MOORE, 1901), *Semiscoleoides*, *Orchibdella*, *Cyclobdella*, *Semiscolex*, *Nesophilaemon*, *Diestecostoma*, *Americobdella*, *Oculobdella*, *Podoclepsis*, *Desmobdella*, *Haementeria*. Of these

2. Occurring only in the Middle American Subregion are (5): *Limnobdella*, *Pintobdella*, *Semiscoleoides*, *Diestecostoma*, *Oculobdella*;

3. Common with the Nearctic Region are (2+1): (see Nearctic Region).

Ethiopian Region

Of the 18 genera (61 species) known from the Region,

1. Endemic are (5, with 8 species): *Salifa*, *Trematobdella*, *Praobdella*, *Marsupiobdella*, *Phyllobdella*;

2. Palaeotropic are (4+1): (see Palaeartic Region);

3. Common with the Oriental Region is (1): *Parabdella*;

4. Common with the Neotropic Region are (2): *Semiscolex*, *Mesobdella*.

Malgassian Region

Of the 5 genera (5 species) known from the Region,

1. Endemic is (1, with 1 species): *Idiobdella*.

The exploration of this region is so deficient that the available data hardly permit evaluation. If the generic assignment of the known species is correct, one might only say that, except for *Salifa perspicax* BLANCHARD, 1897, they indicate Indo-Australian (?) connections.

Oriental Region

Of the 31 known genera (73 species and 10 subspecies) known from the Region,

1. Endemic are (8, with 13 species and 1 subspecies): *Nematobdella*, *Herpobdelloidea*, *Foraminobdella*, *Acrabdella*, *Poecilobdella*, *Planobdella*, *Tritetradella*, *Paraclepsis*;
2. Common with the Palaearctic Region are (8): (see Palaearctic Region);
3. Palaetropic are (4+1): (see Palaearctic Region);
4. Common with the Ethiopian Region is (1): *Parabdella*;
5. Common with the Malgassian Region and the Notogaea are (2): *Haemadipsa*, *Philaemon*;
6. Common with the Notogaea are (2): *Gastrostomobdella*, *Phytobdella*.

Notogaea

Of the 18 genera (34 species and 2 subspecies) known from the Region,

1. Endemic are (10, with 13 species): *Dineta*, *Richardsonianus*, *Hirudobdella*, *Goddardobdella*, *Eunomobdella*, *Euranophila*, *Quantenobdella*, *Aetheobdella*, *Ornithobdella*, *Neoterrabdella*;
2. Common with the Oriental Region are (2): *Gastrostomobdella*, *Phytobdella*;
3. Common with the Oriental and Malgassian Regions are (2): *Haemadipsa*, *Philaemon*;
4. Common with the Malgassian Region is (1): *Chtonobdella*.

As outlined also in the introduction, we are still far, even today, from being able to execute a detailed zoogeographical subdividing of the leeches, from either ecological or regional or faunagenetical aspects. By the study and comparison of the data contained in the above Tables and the regional summaries, all and sundry may, according to his aims, interpret the available information, point out deficiencies, detect errors, etc.

For my part, I abstain from attempting any detailed zoogeographical exposition, at least until the following taxonomic problems are not clarified:

1. The revision of the manifestly heterogeneous and complex genera *Glossiphonia*, *Placobdella*, *Helobdella*, *Batracobdella*, *Theromyzon*, *Hirudo*, *Limnatis*, *Whitmania*;
2. The revision of the genera *Barbronia*, *Praobdella*, *Myxobdella*;
3. The revision of the generic assignment of the following species: *Semiscolex congolensis* SCIACCHITANO, 1939, *Chtonobdella fallax* (BLANCHARD, 1917), *Haemadipsa biloba* MOORE, 1946, and *H. vagans* (BLANCHARD, 1917), *Mesobdella lineata* SCIACCHITANO, 1959, *Philaemon grandidieri* (BLANCHARD, 1917), *Oligobdella brasiliensis* CORDERO, 1937.
4. The establishment of a new genus for *Poecilobdella blanchardi* (MOORE, 1901).

Finally, I should like to submit another Table and some related remarks.

As is to be seen, the Neotropic Region and the Notogaea possess the most differentiated leech faunas. The fauna of the Nearctic Region is also well differentiated, whereas the least differentiated, and this indicates a perhaps stricter connection, is that of the Palaetropic area.

Table 2

The per cent ratio of the endemic genera and their species related to the number of genera and species occurring in the respective region (the Malgassian Region should not be evaluated owing to the scarcity of data)

	Notogaea	Oriental region	Ethiopian region	Palearctic region	Nearctic region	Neotropic region
Genera	55.5	25.8	27.7	33.3	40.0	61.3
Species	36.0	16.8	13.3	19.3	26.0	45.9

The very sharp segregation of the Nearctic and Neotropic faunas is striking, though faunagenetically explicable. The very low number of Holarctic genera is also conspicuous. The highly diverse ratios of the specific numbers of the several families within the zoogeographical regions are also remarkable, the same as the complete absence, or predominance, of certain ecotypes.

However, even these striking zoogeographical features—though some of them may faunagenetically, ecologically, or ethologically be explicable—may essentially be modified by taxonomic work, by chiefly the revision of the genera *Glossiphonia*, *Placobdella*, *Helobdella*, *Batrachobdella*, and *Theromyzon*, to be done in the future.

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Zoogeographischer Überblick über die im Süßwasser und auf dem Land lebenden Hirudineen

Verfasser gibt in seiner vorliegenden Arbeit auf Grund der heutigen Kenntnisse eine kurze Zusammenfassung über die geographische Verbreitung der im Süßwasser und auf dem Land lebenden Hirudineen. Es war nicht Ziel, eine ökologische, regionale oder faunagenetische Erörterung oder Wertung zu liefern, dazu reicht unser bisheriges Wissen noch nicht aus, sondern es wird angestrebt auf Grund der Zusammenstellung auf die systematischen, zoogeographischen, ökologischen und faunistischen Lücken hinzuweisen. Ferner wird auf die Gründe und Tatsachen aufmerksam gemacht die das Vorwärtkommen der zoogeographischen Forschungen behindern.

Das Material wird zuerst — in Familien zusammengefaßt — in Tabellen angeführt, woraus auf den ersten Blick zu ersehen ist, in welcher Region bzw, in welchen Regionen die einzelnen Gattungen bzw. deren Arten vorkommen. Nach den Tabellen werden die bisherigen Kenntnisse nach zoogeographischen Regionen zusammengefaßt, wobei die endemischen Gattungen der einzelnen Regionen (in der Tabelle dicke Kolumnen) und deren Zusammenhänge mit anderen zoogeographischen Regionen angegeben werden, ferner werden Anmerkungen zur Klärung von systematischen und zoogeographischen Fragen gemacht. Die Angaben zu den Tabellen-Zusammenstellungen und Wertungen der Regionen sind dem englischen Text zu entnehmen.